

- 1 1. A graphical user interface element comprising at least one active location for
2 adjusting a texture, wherein the texture is mapped onto a user-defined region of a surface
3 of a three-dimensional virtual object.
- 1 2. The graphical user interface element of claim 1, wherein the at least one active
2 location for adjusting the texture comprises at least one member selected from the group
3 consisting of:
 - 4 (a) a first active location for translating the texture;
 - 5 (b) a second active location for rotating the texture; and
 - 6 (c) a third active location for scaling the texture.
- 1 3. The graphical user interface element of claim 1, wherein the at least one active
2 location for adjusting the texture comprises at least two members selected from the group
3 consisting of:
 - 4 (a) a first active location for translating the texture;
 - 5 (b) a second active location for rotating the texture; and
 - 6 (c) a third active location for scaling the texture.
- 1 4. The graphical user interface element of claim 1, wherein the at least one active
2 location for adjusting the texture comprises:
 - 3 (a) a first active location for translating the texture;
 - 4 (b) a second active location for rotating the texture; and
 - 5 (c) a third active location for scaling the texture.
- 1 5. The graphical user interface element of claim 1, wherein the texture is an image.

- 1 6. The graphical user interface element of claim 1, wherein the texture comprises a
2 tiled pattern.
- 1 7. The graphical user interface element of claim 1, wherein the texture is an
2 embossing pattern.
- 1 8. The graphical user interface element of claim 7, wherein the at least one active
2 location for adjusting the texture comprises an active location for adjusting an embossing
3 height normal to the surface of the virtual object.
- 1 9. The graphical user interface element of claim 7, wherein the at least one active
2 location for adjusting the texture comprises an active location for adjusting an embossing
3 depth normal to the surface of the virtual object.
- 1 10. A haptic graphical user interface element comprising at least one active location
2 for adjusting a texture, wherein the texture is mapped onto a user-defined region of a
3 surface of a three-dimensional virtual object, and wherein the at least one active location
4 is associated with haptic feedback.
- 1 11. The haptic graphical user interface element of claim 10, wherein the at least one
2 active location comprises at least one member selected from the group consisting of:
3 (a) a first active location for translating the texture;
4 (b) a second active location for rotating the texture; and
5 (c) a third active location for scaling the texture.
- 1 12. The haptic graphical user interface element of claim 10, wherein the haptic
2 feedback comprises a gravity well associated with an active location.
- 1 13. The haptic graphical user interface element of claim 10, wherein the haptic
2 feedback comprises a haptic constraint.

- 1 14. The haptic graphical user interface element of claim 13, wherein the haptic
2 constraint is adapted to constrain movement of a cursor to the surface of the virtual
3 object.
- 1 15. The haptic graphical user interface element of claim 13, wherein the haptic
2 constraint is adapted to constrain movement of a cursor to the user-defined region.
- 1 16. The haptic graphical user interface element of claim 13, wherein the haptic
2 constraint is adapted to constrain movement of a cursor to an axis.
- 1 17. The haptic graphical user interface element of claim 16, further comprising at
2 least one haptic detent active on the axis.
- 1 18. The haptic graphical user interface element of claim 13, wherein the haptic
2 constraint is adapted to constrain movement of a cursor to a loop.
- 1 19. The haptic graphical user interface element of claim 18, further comprising at
2 least one haptic detent active on the loop.
- 1 20. The haptic graphical user interface element of claim 13, wherein the haptic
2 constraint is activated by a user signal performed when a cursor is located at an active
3 location for rotating the texture.
- 1 21. The haptic graphical user interface element of claim 13, wherein the haptic
2 constraint is activated by a user signal performed when a cursor is located at an active
3 location translating the texture.
- 1 22. The haptic graphical user interface element of claim 13, wherein the haptic
2 constraint is activated by a user signal performed when a cursor is located at an active
3 location for scaling the texture.

- 1 23. A method for adjusting a texture within a user-defined region of a surface of a
2 three-dimensional virtual object, the method comprising the steps of:
- 3 (a) providing a graphical user interface element comprising at least one active
4 location for adjusting a two-dimensional texture within a user-defined region of a
5 surface of a three-dimensional virtual object; and
- 6 (b) adjusting the texture according to a user manipulation at the at least one
7 active location, wherein the adjusting of step (b) comprises modifying a
8 transformation matrix used in mapping points on the surface of the virtual object to
9 points on the texture.
- 1 24. The method of claim 23, further comprising the step of:
- 2 (c) graphically rendering the virtual object with the adjusted texture.
- 1 25. The method of claim 24, wherein the graphical rendering of step (c) comprises
2 providing a preview of the virtual object with the adjusted texture without changing a
3 volumetric representation of the three-dimensional virtual object.
- 1 26. The method of claim 25, wherein the volumetric representation is a voxel-based
2 representation.
- 1 27. The method of claim 25, further comprising the step of:
- 2 (d) modifying the volumetric representation of the three-dimensional virtual
3 object upon an activation of a user signal.
- 1 28. The method of claim 27, wherein the activation of the user signal comprises at
2 least one of a button click and a button release.
- 1 29. The method of claim 23, further comprising the steps of:
- 2 (c) arming a haptic constraint; and

3 (d) disarming the haptic constraint.

1 30. An apparatus for adjusting a texture within a user-defined region of a surface of a
2 three-dimensional virtual object, the apparatus comprising:

3 (a) a memory for storing a code defining a set of instructions; and

4 (b) a processor for executing the set of instructions, wherein the code
5 comprises a graphical user interface module adapted to provide a graphical user
6 interface element comprising at least one active location for adjusting a texture
7 within a user-defined region of a surface of a three-dimensional virtual object.

1 31. The apparatus of claim 30, wherein the code further comprises a selection module
2 adapted to select one of the at least one active locations of the graphical user interface
3 element based on a two-dimensional correspondence of the active location and a cursor.

1 32. The apparatus of claim 31, wherein the code further comprises a repositioning
2 module adapted to move the cursor to a three-dimensional position corresponding to one
3 of the at least one active locations of the graphical user interface element.

1 33. The apparatus of claim 30, wherein the graphical user interface element is a haptic
2 graphical user interface element, and wherein the at least one active location is associated
3 with haptic feedback.